

REMARKS

Claims 1-25 have been examined. Claims 1-3, 9-16, and 22-25 have been rejected. Applicants note with appreciation that claims 4-8 and 17-21, although objected to, have been deemed to be directed towards allowable subject matter. The present response amends claims 2, 9, 11, 14, and 22-24, respectively. Accordingly, claims 1-25 remain pending. Reconsideration and allowance of all pending claims are respectfully requested.

Objection to Specification

The disclosure has been objected to on the grounds that the status of co-filed application 09/244,754 should be noted. In response, Applicants have amended the Specification to note the issued patent number corresponding to the co-filed application. The Examiner is thanked for his attention to detail.

Rejection of Claims 1 and 12-13

Claims 1 and 12-13 have been rejected under 35 U.S.C. §102(e) as being anticipated by U.S. Patent No. 5,732,113 issued to Schmidl, et al. (hereinafter "Schmidl"). It is respectfully submitted that the rejected claims in fact recite features neither disclosed nor suggested by Schmidl and that the rejection should be withdrawn. Before addressing the differences between the claimed invention as recited by claims 1 and 12-13 and the Schmidl patent, it will first be useful to point out differences in the vocabulary used by the Schmidl patent and by the present application in describing OFDM communication techniques. What the present application refers to as a "frequency domain symbol" or a "tone" would most closely correspond to a "sub-symbol" or a "subcarrier" in Schmidl. Where the present application refers to a "series" of symbols or a "burst" this most closely corresponds to "symbol" in Schmidl.

With this understanding in mind, it is easy to see the differences between the claimed invention and the cited art. Independent claims 1 and 12 recite use of a special “cyclic prefix” that includes a “second portion” that is included for purposes of receiver synchronization. Schmidl fails to disclose or suggest such a cyclic prefix and therefore does not represent relevant prior art.

The rejection points to column 11 line 60 to column 12 line 15 and its description of a “special OFDM training sequence.” This text explains that there are two special OFDM training “symbols” that generally precede other symbols in a frame that are used for synchronization. Schmidl also presents the possibility that the two training symbols can somehow be combined into a single “symbol.” In Schmidl, these training “symbols,” like other OFDM symbols, may have associated cyclic prefixes. A cyclic prefix is appended to a single symbol in the language of Schmidl. However, it makes no sense to assert that such training symbols themselves form some sort of cyclic prefix. Therefore, they cannot represent a part of a “second portion” of a cyclic prefix as required by claims 1 and 12.

Furthermore, looking at the use of cyclic prefixes in the Schmidl patent as a whole, there is no mention of use of the cyclic prefix as anything except a guard interval. It naturally follows then that there is no mention of a cyclic prefix having two portions, one with a length greater than the impulse response of the channel and the other to be used for receiver synchronization. Schmidl is therefore not applicable prior art for claims 1 and 12 and these claims are allowable over the art of record.

Claim 13 is allowable for at least the reason of its dependence from allowable claim 12.

Rejection of Claims 2 and 14-15

Claims 2 and 14-15 have been rejected under 35 U.S.C. 102(e) as being anticipated by Schmidl. Claims 2 and 14 recite use of a special OFDM burst to facilitate receiver synchronization. Periodically spaced frequency domain symbols in the burst have non-zero values and frequency domain symbols between these periodically spaced symbols have null

energy. To expedite prosecution, claims 2 and 14 have been amended to recite, that the “periodically spaced frequency domain symbols are spaced at least four symbols apart.” This feature is neither disclosed nor suggested by Schmidl and is sufficient reason for the allowability of claims 2 and 14.

The rejection points to Fig. 2 as showing features of claims 2 and 14. Fig. 2 illustrates a widely-known and highly beneficial property of OFDM, namely that the peak of the spectrum of a single subcarrier is a null point for the spectra of the other subcarriers, thus allowing data to be transmitted simultaneously in mutually orthogonal and parallel subchannels. Fig. 2, however, does not show that any one subcarrier itself has “null energy,” a threshold requirement for relevance to claims 2 and 14. Instead, it illustrates that non-zero value subcarriers nonetheless have null points within their spectra that correspond to the centers of other subcarriers. Fig. 2 does not show the structure required by claims 2 and 14 where periodically spaced frequency domain symbols (subcarriers in the Schmidl language) have non-zero values and the frequency domain symbols between them have null energy. This is further reason for the allowability of claims 2 and 14. Claim 15 is allowable for at least the reason of its dependence from allowable claim 14.

Rejection of Claims 3 and 16

Claims 3 and 16 have been rejected under 35 U.S.C. 103(a) as being obvious over Schmidl in view of U.S. Patent No. 5,909,470 issued to Barratt, et al., (herein after “Barratt”). Claims 3 and 16 both recite use of a “second portion” of a cyclic prefix “to facilitate receiver synchronization.” As was discussed in reference to claims 1 and 12 the Schmidl patent neither discloses nor suggests this feature. The Barratt patent does not remedy the deficiency of Schmidl in this respect. Accordingly, claims 3 and 16 are allowable over the art of record.

Rejection of Claims 9-10 and 22-23

Claims 9-10, 22-23, and 24-25 have been rejected under 35 U.S.C. §103(a) as being unpatentable over Schmidl in view of Barratt. Claims 9 and 22 have been amended solely for the purpose of clarifying terminology. Claim 24 has been amended to expedite prosecution.

Independent claims 9, 22, and 24, as amended, all recite reception of a “synchronization OFDM burst wherein periodically spaced frequency domain symbols ... have values including non-zero values and frequency domain symbols between said periodically spaced frequency domain symbols have null energy.” Claims 9, 22, and 24 further recite that burst timing alignment is set based on a cost function that measures “periodicity” of the received synchronization burst. Neither Schmidl nor Barratt disclose or suggest setting burst timing alignment in the way required by claims 9, 22, and 24.

Neither Schmidl nor Barratt disclose the use of periodicity of a synchronization OFDM burst in determining burst timing alignment. Furthermore, Schmidl teaches away from the use of periodicity, relying instead on “symbol symmetry” to determine timing. See column 9 lines 6-16. Thus these cited references cannot sustain a *prima facie* case of obviousness against claim 9, 22, and 24. These claims are therefore allowable over the art of record. Claim 23 is allowable for at least the reason of its dependence from claim 22 and claim 25 is allowable for at least the reason of its dependence from claim 24.

Rejection of Claim 11

Claim 11 has been rejected under 35 U.S.C. §103(a) as being unpatentable over Schmidl in view of Barratt. Claim 11, as amended, recites reception of “at least one OFDM synchronization burst,” that the OFDM synchronization burst includes “periodically spaced frequency domain symbols” that “have values including non-zero values”, and that “frequency domain symbols between said periodically spaced frequency domain symbols have null energy.” Furthermore, claim 11 requires that the “periodically frequency domain symbols are spaced at least four symbols apart.”

As was discussed above, these features are neither disclosed nor suggested by the Schmidl patent. The Barratt patent does not address this deficiency of the Schmidl patent. Claim 11 is therefore allowable over the art of record.

Conclusion

For the foregoing reasons, Applicant believes all the pending claims are in condition for allowance and should be passed to issue. If the Examiner feels that a telephone conference would in any way expedite the prosecution of the application, please do not hesitate to call the undersigned at (408) 446-8694.

Respectfully submitted,



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